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Sediment patterns of the underwater slope of the south-eastern Baltic Sea (Lithuanian sector)

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The underwater slope of the Baltic Sea in the Lithuanian nearshore zone due to obvious differences of geological structure is divided into two parts – the mainland slope and the Curonian Spit slope. Recent environmental changes and sediment distribution within these regions are discussed on the background of grain size composition of bottom sediments. Sediment samples in the nearshore zone were taken down to the depth of 15–20 m along 92 profiles oriented perpendicularly to the shoreline and spaced at 500–1000 meters. There were determined 23 granulometric fractions, sediment median diameter (Md) and sorting (S_o). Fine-grained sand is most widespread in the study area. The mainland underwater slope is characterised by areas of eroded relict Pleistocene till deposits. Exclusively recent sediments occur along the Curonian Spit. From the point of recent environment and sediments, the Lithuanian nearshore is characterized by four facial complexes: 1) sands of the shallowest nearshore zone between the coastline and a depth of 1.5–2 m, 2) sand and gravel of the zone of accumulative bars and erosion troughs at a depth of 2–6 m, 3) fine-grained sand of the nearshore declivity beginning beyond the boundary of the bar–trough zone, and 4) eroded tills with depositional areas of sand, gravel and pebble in the morainic plain (the mainland underwater slope).

Key words: nearshore, grain size, surficial bottom sediments, sand, facies

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INTRODUCTION

The underwater slope of the South-Eastern Baltic in the Lithuanian coastal area obtained its main features approximately 4–5 thousand years ago. It has a sophisticated relief. The morainic Klaipëda–Ventspils plateau occupies most of the mainland nearshore zone north of Klaipëda. It is represented by abrasional–accumulative surface with morainic ridges (up to 5–7 m high) and other meso- and microforms. The underwater slope along the Curonian Spit has a smooth inclined accumulative surface. Accumulative bars and erosion troughs between them in the nearshore sand zone are typical of the underwater slope.

Recent dynamic changes of the underwater slope reflected in the relief and sediment composition are predetermined by action of waves. According to their intensity and direction, rates of wave-induced currents, surf and swash flows and effects of other hydrodynamic phenomena, the underwater slope is rather heterogeneous. This is demonstrated in the morphological–dynamic analysis and classification of the coastal zone (Gudelis, Janukonis, 1977; Kirlys, Janukonis, 1993; Janukonis, 1994; Gelumbauskaitë, 2003) and pointed out in the studies of Quaternary deposits (Gulbinskas, Gaigalas, 1997), the composition and distribution of recent sediments (Gulbinskas, Trimonis, 1999), grain size variations of bottom sediments (Gaigalas et al., 1999; Kairytë, 1999, 2000, etc.) and specific features of sedimentation processes (Pustelnikov, 1982; Kairytë et al., 2005, etc.).

By the present work the authors endeavour to reveal peculiarities of the recent environment of the nearshore, based on the distribution of surficial bottom sediment types and parameters of their granulometric composition.

One of the essential characteristics of the underwater slope depends on sedimentation processes whose specific features are predetermined by regional factors. Among them we can mention the dynamics of sedimentary material transport from the sources to the areas of accumulation, including transition routes in the south-eastern part of the Baltic Sea (Knaps, 1966; Aibulatov, 1990; Gulbinskas, 1994; Repeèka et al., 1997; Emelyanov et al., 2002, etc.).

METHODS

Data on bottom sediments of the underwater slope in the study area (Fig. 1) were collected in 2001–2002 within the framework of the geological atlas of the Lithuanian coasts (Bitinas et al., 2003). Bottom sediment samples were taken from 92 profiles spaced 500–1000 m perpendicularly to the shoreline till the depth of 15–20 m taking into consideration the specific features of the bottom relief (5–7 samples from a profile). The surficial bottom sediments (0–3 cm) were taken using a Van Veen type grab. The depth was measured with a KING MARINE M 1060 echo sounder and the sampling sites were determined by GPS.

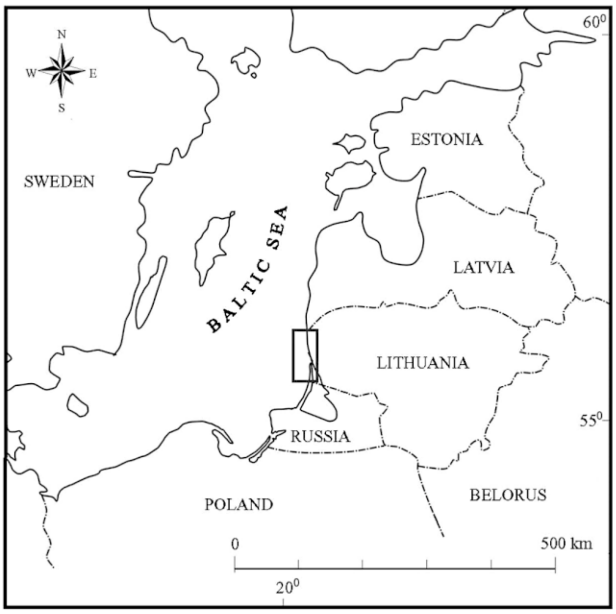

Fig. 1. Situation map of the study area
1 pav. Tyrimø rajono situacijos schema

Laboratory examination of the grain size composition of bottom sediments was determined using a standard pipette and dry sieving methods for 23 fractions (from <0.05 mm to >10 mm). The type of sediments was determined according to the dominant fraction and median diameter (Md) using the decimal classification system. The following granulometric types of sediments were distinguished: boulders (>100 mm), pebbles (100–10 mm), gravel (10–1 mm), coarse sand (1–0.5 mm), medium sand (0.5–0.25 mm), fine sand (0.25–0.1 mm), coarse silt (0.1–0.05 mm) and fine silty mud (< 0.05 mm). The median diameter (Md) and sorting (S_o) parameters of sediments were calculated according to the method of Trask (1930).

RESULTS

The mainland underwater slope is characterized by profiles representing best-pronounced types of bottom surface relief and sediment distribution patterns (Fig. 2). The sloping bottom surface between the Latvian border and Šventoji is covered by fine sand with scanty small outcrops of pebble and boulders. The fine sand is composed of two main fractions – fine sand (0.25–0.1 mm) and coarse silt (0.1–0.05 mm). Their ratio is uneven; Md ranges from 0.09 to 0.22 mm, S_o ranging from 1.12 to 1.42 (profiles 1–5). The deepest part (16.4 m) of profile 4 is covered by medium sand with gravel (20.42%). The next profile 5 borders on the field of tills at a depth of 15 m.

The sand accumulation belt of the Šventoji–Palanga sector is narrowing southward in the shallow part of the nearshore, whereas the boundary of the relict pebble–boulder area begins at a depth of 15 m and extends to the depth of 4–5 m at the approaches to Palanga. Profiles 8 and 9, typical of this sector, still have a relatively wide accumulation belt of fine sand (Md 0.1–0.16 mm, S_o 1.16–1.24). The sediments are composed of two main fractions: 0.25–0.1 mm and 0.1–0.05 mm. Their total sum accounts for 90%. Medium sand (Md 0.28 mm, S_o 1.36) was detected at a depth of 10.3 m near the area of till sediments (profile 9). To the southernmore, small areas of fine and medium sand occur in the local depressions of the till deposit area (profile 15).

A great part of underwater slope of the Palanga–Nemirseta sector is occupied by pebble and boulder fields. Sand accumulation takes place only in a narrow belt (about 200 m wide) to the depth of 2–3 m. The till deposits (pebble–boulders) are interspersed by small fine sand areas with the prevailing 0.25–0.1 mm fraction and a relatively high content of coarse silt (up to 22.8% at a depth of 3.4 m, profile 22).

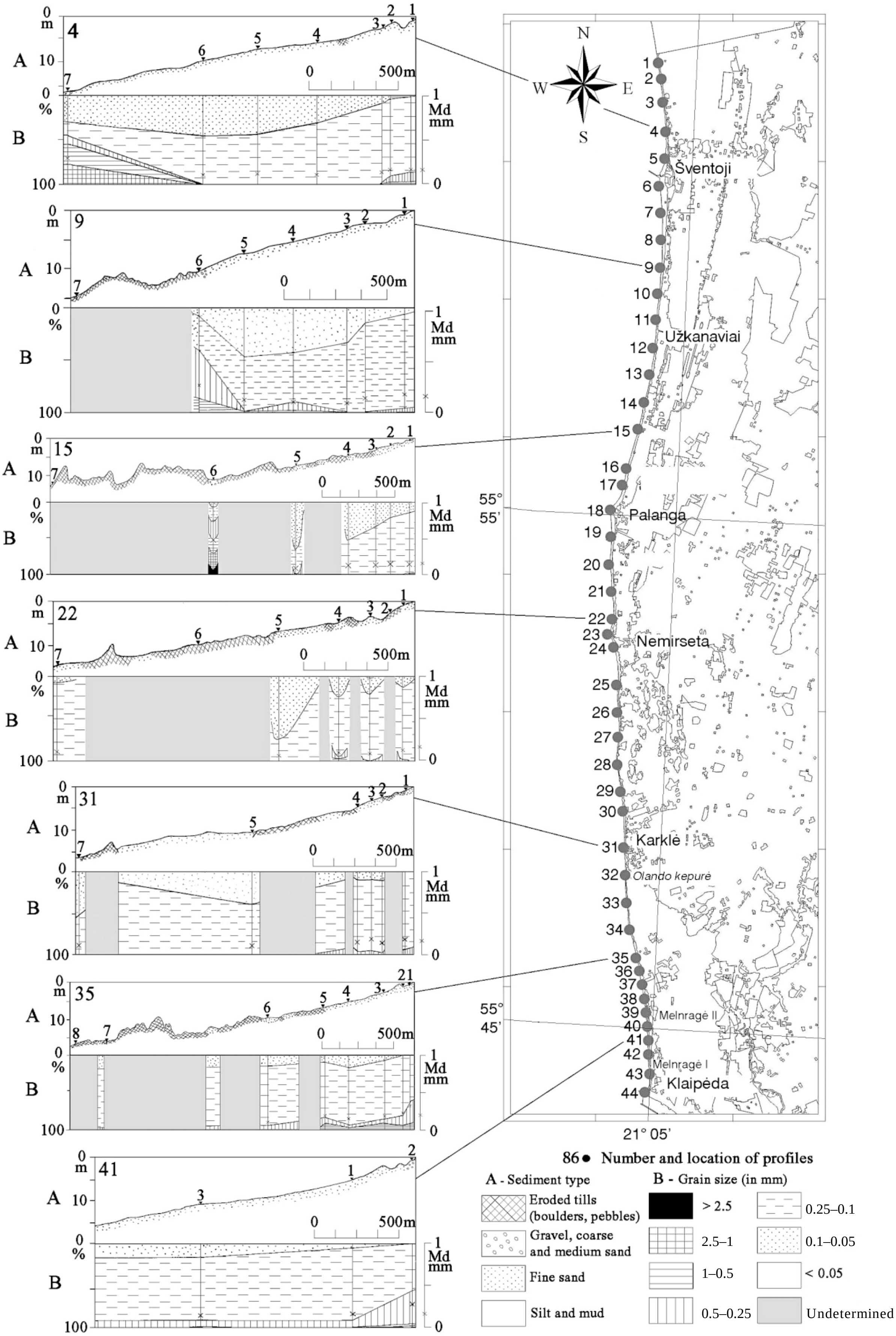

Fig. 2. Location of morphological and sedimentological profiles on the mainland nearshore zone
2 pav. Morfologiniø ir sedimentologiniø profiliø padëtis þemyninio kranto priekrantëje

Usually coarse silt accumulates with increasing depth (deeper than 7 m, profiles 22 and 23).

The areas of till deposits become relatively smaller and the zone of sand accumulation expands in the Karklë sector (profiles 29–33). The accumulation belt of fine sand is often interspersed by pebble areas (profiles 31 and 32). Fine sand (Md 0.098–0.18 mm, S_o 1.14–1.22) accumulates between the shoreline down to the depth of 4–5 m or locally even to the depth of 16.3 m (profile 31). Silt fractions (reaching 54.11%) increase at greater depths.

Further southward the areas of sand accumulation again decrease (profiles 34–38). Profiles 34 and 35 are typical of this sector. They show that fine sand prevails not only in the shallow part of the nearshore where fragments of bar development are visible, but also intersperses pebble and boulders of the deeper areas. It must be pointed out that the 0.25–0.1 mm fraction is dominant everywhere (about 80–90%). Its portion reduces to 63% only near the shore at a depth of 1.1 m. Silt material accounts for up to 15–17% and gravel is absent altogether. Md of sand is 0.13–0.23 mm, S_o 1.17–1.24.

Pebble and boulder fields disappear in the upper part of the underwater slope of the Melnragë–Klaipëda sector. The typical profile 41 presents an inclined slope with small fragments of accumulative bars–erosion troughs at a depth of 1–4 m about 200 m from the shoreline. Fine sand (Md 0.17–0.24 mm, S_o 1.21–1.25) accumulates on the bottom surface. It is predominated by 0.25–0.1 mm fraction (up to 88.66%).

Several typical relief and bottom sediment profiles of the underwater slope reflect the present dynamic state of the Curonian Spit nearshore (Fig. 3). The underwater slope is very inclined and smoothened by fine sand at the southern jetty of the Klaipëda port (profile 46). The main portion of sediments at a depth of 2–10 m is composed of fine sand fraction (up to 95.26%). The S_o of sediments ranges from 1.12 to 1.17. The portion of coarser sand with a small admixture of gravel (up to 1%) increases at a smaller depth approaching the coast. In deeper areas (>10 m), sediments become more fine-grained due to a higher portion of silt particles. Their content at a depth of 21.3 m accounts for 41.26%. The value of sorting also increases (S_o 1.38). Variations of granulometric composition of sediments are gradual and correspond to the increasing depth.

Characteristic erosion troughs and accumulative bars appear about 100–150 m southward from the southern jetty. They differ in morphological features and the composition of sediments. This is very obvious in profile 48: sandy gravel covers the bottom of the erosion trough (depth 6.9 m) 500 m from the coastline. Gravel accounts for 59.59%, silty material is actually absent (0.09%), and the fine sand fraction which is dominant in the rest part of the profile accounts here for 3.3%. The S_o of gravel is 1.56, whereas this value for fine sand is 1.14–1.19. Fine sand gradually becomes coarser with approaching the coast. Offshore from the erosion trough, the bottom depth is gradually increasing and the composing sediments become finer. At a depth of 16.7 m sand fractions account for 78.45% and silt fractions for 21.55% of sediments.

The bottom relief of the Smiltynë–Juodkrantë sector is composed of accumulative bars and erosion troughs at a distance 300–400 m from the coastline. Though they differ in size and the level of development, the general view of the bottom surface is rather uniform. Fine sand is the dominant constituent of sediments. Profile 59 in the environs of Alksnynë is typical of this bottom sector. Up to six accumulative bars and erosion troughs can be distinguished in the bottom surface. The trough furthermost from the coast is 4.6 m deep. It is followed by a well-developed bar (the depth is 3 m). The underwater slope beyond the bar is gradually sinking down and covered by fine sand with a gradually increasing portion of silt fractions. The bottom of erosion trough is covered by coarse sand with a large portion of gravel (26.58%) and actually without silt fractions. S_o of sediments is 1.5. Closer to the coast the grain size of sediments is very changeable, but the fine sand fraction prevails.

The bar zone narrows to 300 m in the environs of Juodkrantë. The relative depth of erosion troughs increases to almost 4 m. Therefore, the relief in the upper part of the nearshore is more contrasting. The deeper part of the nearshore is evenly sloping. Fine sand covers the greater part of the bottom surface. Yet in the zone of the contrasting relief the composition of sediments varies (profiles 68, 69 and 70). Fine sand (Md 0.22 mm, S_o 1.17) covers the bottom of the erosion trough of profile 68. Approaching the coast, the portion of coarser clastic material rapidly increases. Sandy gravel (Md 1.32 mm, S_o 1.93) lies at a depth of 0.4 m near the coast. In the closest profile 69, the bottom of the same erosion trough is covered by sandy gravel (Md 1.10 mm, S_o 1.26) with 38.15% of sand fraction and no silt material. Closer to the coast only fine sand is accumulating. Further to the south (profile 70) the shallow part of the nearshore is covered by coarse sand (Md 0.84 mm, S_o 1.26) and sandy gravel (Md 1.34 mm, S_o 1.31). Deeper (depth > 5 m) fine sand is accumulating with an increasing portion of silt (Md 0.16 mm, S_o 1.18, depth 16.3 m).

In the middle of the Juodkrantë–Pervalka sector, the relief of the shallow nearshore becomes rather monotonous. Only one well-developed and relatively deep (almost 6 m) erosion trough stands out 400 m from the coast (profile 75). The underwater slope is covered by fine sand (sediments of the trough bottom were not investigated) with Md from 0.13 mm

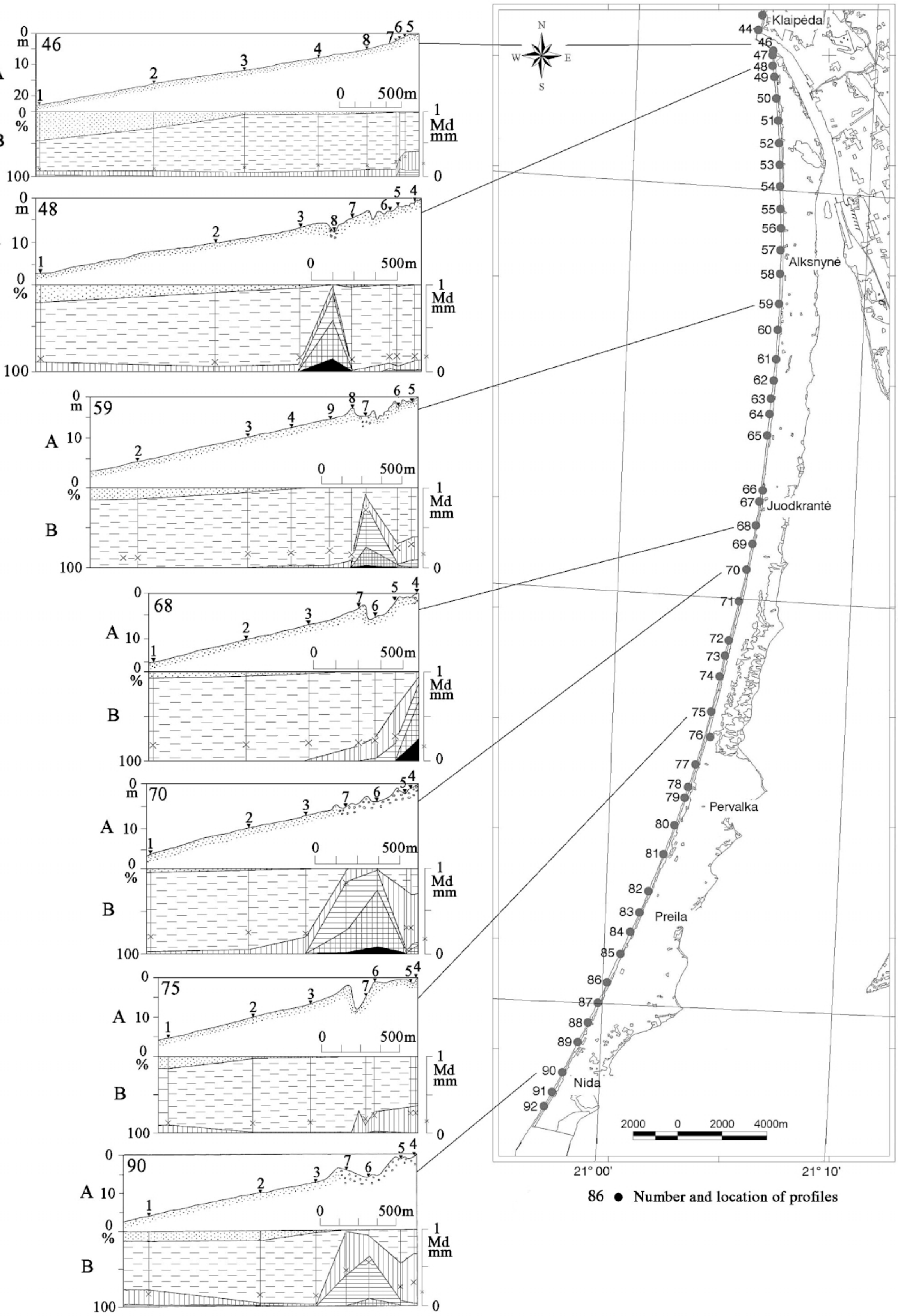

Fig. 3. Location of morphological and sedimentological profiles on the Curonian Spit nearshore zone
For legend, see Fig. 2

3 pav. Morfologiniø ir sedimentologiniø profiliø padëtis Kurðiø nerijos priekrantëje
Legendà þr. 2 pav.

(at a depth of 15 m) to 0.23 mm (closest to the coastline at a depth of 0.7 m). The dominant 0.25–0.1 mm fraction accounts for 96% of sediments, S_o is 1.16. The portion of silt fractions increases in deeper areas to 15.42%. Farther southward from Pervalka, the bottom relief of the shallow nearshore (depth <5 m) is more sophisticated. It is composed of three erosion troughs and bars. The granulometric composition of sediments is also more variable.

A big erosion trough becomes well expressed in the Preila-Nida sector. Its relative depth reaches almost 6 m (about 400 m from the coastline). Coarser sediments are accumulating between the trough and the coast (medium or coarse sand with gravel admixture). In the offshore direction, only fine sand with varying portions of silt material is accumulating. Coarse sand (Md 0.58 mm, S_o 1.34) with gravel (9.55%) and actually without silt fractions (only 0.02%) is accumulating in the trough near Nida (profile 90). Deeper than 5 m the fine sand fraction prevails (up to 94.02%). Its content becomes relatively smaller at a greater depth due to accumulation of silt material. This pattern of sediments is characteristic of the whole nearshore in the Preila–Nida sector.

DISCUSSION

Due to obvious differences of its geological structure, the underwater slope of the Baltic Sea in the study area is divided into the mainland and the Curonian Spit parts. The environmental changes of this region are unevenly manifested in different sectors of the nearshore due to specific features of hydrodynamic factors (wave action and parameters characterizing currents and flows) and geological–geomorphological peculiarities of the bottom, especially due to the composition of bottom sediments and the amount of drift material participating in sedimentation processes. Results of numerous investigations have shown that the nearshore is actually constituted of many local bottom areas differing in material and energy circulation. The summary result of this phenomenon is recognized from the specific features of bottom relief and sediment facies. So the present nearshore can be divided into zones, sectors or other units depending on the details and tasks of individual research (Kirlys, 1968, 1976; Gudelis, 1970; Þaromskis, 1974; Dolotov et al., 1982; Þaromskis, Kirlys, 1989; Kirlys, Janukonis, 1993; Gulbinskas, Trimonis, 1999; Kairytë, 2000, etc.). Sometimes bottom sediments are strongly affected by anthropogenic factors (Þaromskis, 1994; Gulbinskas, 1999, etc.)

It is known that intensive transverse sediment transport and alongshore migration flows (strongest in the Nemirseta–Palanga sector) with the resultant directed northward are dominant in the mainland underwater slope (Janukonis, 1994). According to statistical indices of granulometric data (mean grain size, skewness, excess, standard deviation or sorting), the most distinctive changes of sedimentation occur in the cross profile of the nearshore (Kairytë, 2000). Hydrodynamics and sedimentodynamics are most intensive in the surf and swash zones and are reflected in the forms of bottom relief and sediment types. In deeper areas, the intensity of sedimentation processes gradually decreases until a certain equilibrium when transit sediment movement becomes dominant. Eroded bottom areas in the shallow nearshore (up to 2 m in depth) alternate with zero sedimentation areas, and the processes of accumulation bear a local character. At a greater depth sediment accumulation is dominant, except the morainic ridged plain with fields of pebble–gravel and boulders.

The recent sediment distribution patterns in typical profiles prove that the mainland nearshore is heterogeneous and complicated. Almost in all accumulative zones, bottom sediments are composed of fine-grained sand. Medium sand is accumulating on the till deposits (profile 15) and coarse sand occurs in the shallow nearshore with bars and active erosion processes (profile 41). A greater number of accumulative bars occur south of the Olando Kepurë Cape, but variations of relief are poorly expressed in the granulometric spectrum of bottom sediments.

The changing ratio between the surface areas of fine-grained sand accumulation and eroded areas is a distinctive feature of the mainland underwater slope. Accumulation areas (down to the depth of 15 m and more) occupy a greater part of the nearshore north of Šventoji (profile 4). They are narrowest south of Palanga (profiles 22, 23 and 27). Yet in many places fine-grained sand is interspersed in till deposits (pebble and boulder fields) or covers them (profiles 31, 32, 34 and 35). These processes are subject to an intensive and sophisticated influence of various factors (hydrodynamic–neotectonic), but the tendency of accumulation area expansion remains stable.

Descriptions of the recent dynamic state of the Curonian Spit underwater slope usually refer to its two different parts: between Klaipëda and Juodkrantë, where accumulation processes are active, and south of Juodkrantë, where sediment transport from south to north is becoming ever more distinct (Janukonis, 1994). From the point of view of sedimentation environment and facies, the sediment distribution patterns on this nearshore are visually marked by variations of depth. The bar zone occupying the shallow part of the nearshore (about 300–600 m in width) to a depth of 4–6 m and distinctly differing from the deeper part of the underwater slope (6–15 m) is especially typical of this region. It must be pointed out that local differences of the bottom surface and variations of granulometric parameters of fine-grained sand occur along and across the nearshore.

The shallow nearshore zone is distinguished by a sufficient amount of Holocene sediments favouring distinct relief changes occurring under the influence of waves. As a result, accumulative forms differing in their size, time of existence and number develop in different nearshore sectors. The causes of formation of troughs and bars are discussed in many works (Kirlys, 1964; Þaromskis, 1974; Dolotov et al., 1982, etc.). Without going deeper into this problem we can only point out that the shallow nearshore belongs to the barrier "shore–sea" zone (Emelyanov, 1998) and should be distinguished as a specific facies zone with typical elements.

The accumulative bars of the study region are often separated by deep (6–8 m) erosion troughs formed by swash flows and wave deformations-induced currents. Therefore, the bottom of troughs is covered by coarser material: sandy gravel (profiles 48, 69 and others), coarse-grained sand with gravel (profiles 59, 78, 90 and others), rarely by fine sand (profile 68). Thus, the processes of differentiation in this part of the nearshore are most complicated. This is proved by previous detailed investigations of sediment texture (Dolotov et al., 1982).

The bottom surface of the offshore part of the bars (at a depth of 10–15 m) is covered by fine-grained sand predominated by the 0.25–0.1 mm fraction. Though generally the portion of silt fractions increases in deeper areas, the differences of the granulometric spectrum bear a local character. This accumulation regime is predetermined by a relatively more stable recent state of this nearshore part and of the waves and currents acting here.

CONCLUSIONS

The environmental state of the Lithuanian nearshore is predetermined by factors of different scale. Regional and local changes of the hydrodynamic regime and sedimentary material balance are best reflected in the composition of bottom sediments.

Sand is the dominant sediment type. Gravel and coarser clastic material are spread locally except the areas of relict Pleistocene deposits in the mainland underwater slope (morainic plain). Coarse and medium sand is typical of the shallow part of the nearshore where it occurs at a small depth (down to 2 m) close to the coastline and in the bottom of erosion troughs. Fine-grained sand is most widespread in the nearshore. Very often only variations of its granulometric indices reflect the differences of recent environment in the underwater slope. Silt and mud play a minor role in recent sedimentation.

Analysis of collected data allows to distinguish typical facies complexes characterizing the recent nearshore environment. They are:

1) sands of the shallowest nearshore zone between the coastline and the depth of 1.5–2 m;

2) sand and gravel of the zone of accumulative bars and erosion troughs, which is especially well expressed at a depth of 2–6 m on the underwater slope of the Curonian Spit;

3) fine-grained sand of the nearshore declivity beginning beyond the boundary of the bar zone;

4) eroded tills with depositional areas of sand, gravel and pebble in the morainic plain (the mainland underwater slope).

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PIETRYTINËS BALTIJOS JÛROS DALIES POVANDENINIO ÐLAITO NUOSËDOS (LIETUVOS SEKTORIUS)

S a n t r a u k a

Pietrytinës Baltijos jûros dalies (Lietuvos sektorius) povandeninio ðlaito geologinë sandara nevienalytë: tarp Klaipëdos ir Latvijos sienos didesnëje priekrantës dalyje vyrauja abrazinis-akumuliacinis reljefas, o á pietus nuo Klaipëdos iðilgai Kurðiø nerijos povandeninis ðlaitas turi iðlygintà nuoþulnø akumuliaciná pavirðiø. Nevienoda priekrantës geologinë sandara ir ðiuolaikiniai sedimentacijos procesai nulëmë didelæ dugno nuosëdø ávairovæ. Tai patvirtino nauja medþiaga, kuri buvo gauta 2001–2002 m. atliekant iðsamius Lietuvos jûros kranto tyrimus. Dugno nuosëdø mëginiai iðtirti 92 profiliuose iki 15–20 m gylio.

Vyraujantis priekrantëje dugno nuosëdø tipas yra smëlis. Þvirgþdas ir stambesnës nuotrupinës nuosëdos paplitusios vietomis, iðskyrus þemyninio kranto povandeniná ðlaità, kuriame daugelyje vietø atsidengia reliktinës pleistoceno nuogulos. Stambus ir vidutinis smëlis bûdingas sekliajai priekrantës daliai – nedideliame gylyje (iki 2 m) arti dinaminës kranto linijos, taip pat eroziniø lomø dugnui (tarpsëkliams). Smulkus smëlis paplitæs visoje priekrantëje, o jo granuliometriniø rodikliø kaita leidþia pastebëti dabartiniø aplinkos sàlygø skirtumus atskirose ðlaito zonose. Aleuritas ir molis (dumblas) nebûdingi dabartinei akumuliacijai priekrantës zonoje. Pagal pavirðiniø dugno nuosëdø granuliometrinës sudëties tipus ir jø susidarymui didþiausià poveiká turinèius hidrodinaminio reþimo veiksnius Lietuvos jûros priekrantëje galima iðskirti tokius facinius kompleksus: 1) sekliausios (iki 1,5–2 m gylio) priekrantës zonos ávairiagrûdis smëlis, 2) smëlis ir þvirgþdas sëkliø zonoje (2–6 m gylyje), ypaè bûdingas Kurðiø nerijos povandeniniam ðlaitui, 3) smulkus smëlis priekrantës nuolaidumoje giliau sëkliø zonos ir 4) smëlis bei gargþdas su rieduliais moreniniø nuogulø erozijos plotuose.

Ýãèäèþñ Òðèìîíèñ, Ñàóëþñ Ãóëüáèíñêàñ, Ìîäåñòàñ Êóçàâèíèñ

ÎÒËÎÆÅÍÈß ÏÎÄÂÎÄÍÎÃÎ ÑÊËÎÍÀ ÞÃÎ-ÂÎÑÒÎ×ÍÎÉ ×ÀÑÒÈ ÁÀËÒÈÉÑÊÎÃÎ ÌÎÐß (ÑÅÊÒÎÐ ËÈÒÂÛ)

Ð å ç þ ì å

Ïîäâîäíûé ñêëîí þãî-âîñòî÷íîé ÷àñòè Áàëòèéñêîãî ìîðÿ (ñåêòîð Ëèòâû) ïî ãåîëîãè÷åñêîìó ñòðîåíèþ íåîäíîðîäåí: íà áîëüøåé ÷àñòè ïðèáðåæíîé çîíû ìåæäó Êëàéïåäîé è ãðàíèöåé ñ Ëàòâèåé äîìèíèðóåò àáðàçèîííî-àêêóìóëÿòèâíûé ðåëüåô, à

þæíåå Êëàéïåäû âäîëü Êóðøñêîé êîñû ïîäâîäíûé ñêëîí èìååò ðoâíóþ ïîëîãóþ àêêóìóëÿöèîííóþ ïîâåðõíîñòü. Íåîäíîðîäíîñòü ãåîëîãè÷åñêîãî ñòðîåíèÿ ïðèáðåæíîé çîíû è ñîâðåìåííûå ñåäèìåíòàöèîííûå ïðîöåññû îáóñëîâèëè áîëüøîå ðàçíîîáðàçèå äîííûõ îñàäêîâ. Ýòî ïîäòâåðäèëè íîâûå ìàòåðèàëû, ïîëó÷åííûå âî âðåìÿ äåòàëüíûõ èññëåäîâàíèé ìîðñêèõ áåðåãîâ Ëèòâû â 2001–2002 ãã. Èçó÷åíû îáðàçöû äîííûõ îñàäêîâ ñ 92 ïðîôèëåé íà ãëóáèíå ìîðÿ äî 15–20 ì.

Ñðåäè îñàäêîâ ïðèáðåæíîé çîíû äîìèíèðóåò ïåñîê. Ãðàâèé è áîëåå êðóïíûå îáëîìî÷íûå îñàäêè èìåþò ëîêàëüíîå ðàñïðîñòðàíåíèå, çà èñêëþ÷åíèåì ìàòåðèêîâîãî ïîäâîäíîãî ñêëîíà, íà êîòîðîì âî ìíîãèõ ìåñòàõ îáíàæàþòñÿ ðåëèêòîâûå îòëîæåíèÿ ïëåéñòîöåíà. Êðóïíûé è ñðåäíèé ïåñîê õàðàêòåðåí äëÿ ìåëêîâîäíîé ÷àñòè (ãëóáèíîé äî 2 ì) ó áåðåãîâîé ëèíèè, à òàêæå äëÿ äíèù ýðîçèîííûõ ëîæáèí. Ìåëêèé ïåñîê ðàñïðîñòðàíåí ïîâñåìåñòíî âî âñåé ïðèáðåæíîé çîíå è ïî èçìåí÷èâîñòè åãî ãðàíóëîìåòðè÷åñêèõ ïàðàìåòðîâ ìîæíî ñóäèòü î ðàçëè÷èÿõ ñîâðåìåííûõ óñëîâèé ñðåäû íà ëîêàëüíûõ ó÷àñòêàõ ïîäâîäíîãî ñêëîíà. Àëåâðèòû è ãëèíà (èë) äëÿ ñîâðåìåííîé ïðèáðåæíîé àêêóìóëÿöèè íå õàðàêòåðíû. Ïî ãðàíóëîìåòðè÷åñêèì òèïàì ïîâåðõíîñòíûõ äîííûõ îñàäêîâ è ïî ôàêòîðàì ãèäðîäèíàìè÷åñêîãî ðåæèìà, îêàçûâàþùåãî íàèáîëüøåå âëèÿíèå íà ôîðìèðîâàíèå îñàäî÷íîãî ñëîÿ, ïðèáðåæíóþ çîíó Ëèòâû ìîæíî õàðàêòåðèçîâàòü ñëåäóþùèìè ôàöèàëüíûìè êîìïëåêñàìè: 1) ðàçíîçåðíèñòûé ïåñîê íàèáîëåå ìåëêîâîäíîé ÷àñòè (äî 1,5–2 ì) ïðèáðåæíîé çîíû; 2) ïåñîê è ãðàâèé çîíû âàëîâ (2–6 ì), îñîáåííî õàðàêòåðíûå äëÿ ïîäâîäíîãî ñêëîíà Êóðøñêîé êîñû; 3) ìåëêîçåðíèñòûé ïåñîê íà ïîêàòîì ñêëîíå ãëóáæå çîíû âàëîâ; 4) ïåñîê-ãàëüêà ñ âàëóíàìè íà ýðîäèðîâàííûõ ïëîùàäÿõ ìîðåííûõ îòëîæåíèé.